

REMARKS

I. PRELIMINARY REMARKS

Minor amendments have been made to the specification. Claims 8, 11, 14, 15, 17, 82 and 83 have been amended. No claims have been added. Claims 90-97 have been canceled in response to the restriction requirement. Claims 1-9, 11-17, 20 and 82-89 remain in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

II. OBJECTION AND REJECTION UNDER 35 U.S.C. §§ 112 AND 132

A. The Objection and Rejection

The amendment filed June 23, 2004 has been objected to under 35 U.S.C. § 132 for purportedly introducing new matter into the specification. Claims 82-89 have been rejected under 35 U.S.C. § 112, first paragraph, as purportedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, has possession of the invention. Applicant respectfully submits that the objection under 35 U.S.C. § 132 and rejection under 35 U.S.C. § 112, first paragraph, have been rendered moot by the amendments to the specification and claims 82 and 83. Nevertheless, in order to advance prosecution, the support in the specification for amended claims 82 and 83 is discussed below.

B. Support for Claims 82 and 83

At the outset, applicant notes that the previous objection/rejection appeared to be stem at least in part from the Examiner's refusal to allow applicant to claim aspects of the inventions that are shown in the drawings because, in the Examiner's opinion, the drawings are "merely schematic" and arguments based on "measurement" of the drawing are of little value. [Office Action at pages 7 and 8.]

The Brief Description of the Drawings section of the application, which the Examiner has referenced on more than one occasion, indicates that the drawings in question are "diagrammatic," not "merely schematic." Applicant respectfully submits that the word "diagrammatic" means "[a] plan, sketch, drawing, or outline designed to **demonstrate or explain how something works or to clarify the relationship between the parts of a whole.**" *The American Heritage® Dictionary of the English Language, Fourth Ed. (2000)*, emphasis added. Applicant is claiming the manner in which the present inventions work and relationship between the elements of the invention. Moreover, applicant's arguments are not based on measurements of the drawings. Rather, they are based on the functions and relationships which are clearly illustrated in the drawings.

Turning to claims 82 and 83, the present application as originally filed included a number of exemplary embodiments in which the fuel droplets are directed into fuel passages in a direction that is non-perpendicular to (and substantially parallel to) the anode surface that receives fuel. Referring to Figures 1 and 3, which are reproduced below, the application as originally filed indicated that the anodes 106 have surfaces 124 that receive fuel. The application also clearly indicated that there are fuel passages 114 adjacent to the anode surfaces 124 that receive fuel and that fuel droplets 120 can be supplied by a variety of fuel supply apparatus 118. The arrows in Figure 1 clearly indicate that fuel is directed into the fuel passages 114 in a direction that is non-perpendicular to (and substantially parallel to) to the surfaces of the anodes that receive fuel.

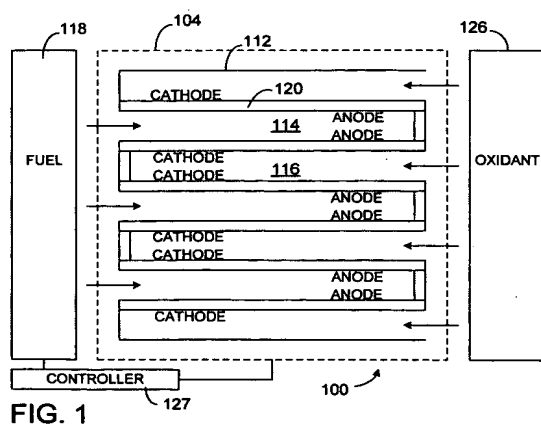


FIG. 1

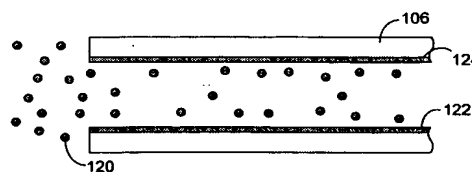


FIG. 3

The present application also discloses a variety of fuel supply apparatus which supply droplets in the manner described above. One example of such an

apparatus is the fuel supply apparatus 118e illustrated in Figures 13-18, which includes drop ejectors 172 with nozzles 186. [Figures 14 and 18 are reproduced below.]

The drop ejectors 172 in the fuel supply apparatus 118e operate in a number of firing modes. In one firing mode, the fuel droplets ejected by the drop ejectors 172 “travel in a direction that is generally perpendicular to the plane defined by the outermost portion of the nozzle (i.e. straight out of the nozzle).” [Specification at page 9, line 31 to page 10, line 1.] The specification also indicates that “such an arrangement may be used to fire a plurality of droplets straight into the fuel passages 114.” [Specification at page 10, lines 1-3.] Given the relative positions of the drop ejector 172 and the anode 106 “diagrammatically” illustrated in Figure 18,¹ applicant respectfully submits that one of skill in the art would recognize that droplets fired straight out of the drop ejector nozzles 186 into the fuel passage 114 would be fired in a direction that is **parallel** to the surface of the anode 106 that receives fuel. [Note that fuel layer 122 forms on surface 124.]

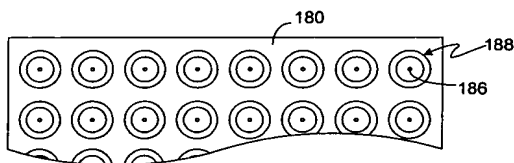


FIG. 14

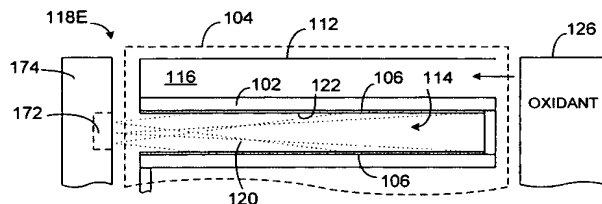


FIG. 18

In an alternative firing mode, the drop ejectors 172 “fire fuel droplets toward the surface of each anode 106 in the manner illustrated for example in Figure 18.” [Specification at page 10, lines 9-13.] Given the relative positions of the drop ejector 172 and the anode 106, as well as the droplet paths illustrated in Figure 18, applicant respectfully submits that one of skill in the art would recognize that droplets fired into the fuel passage 114 toward the anode 106 would be fired in a direction that is **non-perpendicular** to the surface of the anode that receives fuel. [Note that fuel layer 122 forms on surface 124.]

¹ As noted above, a diagrammatic illustration is an illustration that “demonstrate[s] or explain[s] how something works” and “clarif[ies] the relationship between the parts of a whole.”

In view of the foregoing, and although the application as filed did not include the exact phrase “a fuel supply apparatus that directs a plurality of fuel droplets into the fuel passage in a direction that is non-perpendicular to (or substantially parallel to) the anode surface that receives fuel,” applicant respectfully submits that such a fuel supply apparatus was illustrated and described in a manner that satisfies the requirements of 35 U.S.C. §§ 112 and 132.

III. PRIOR ART REJECTIONS

A. The Rejections

Claims 1-3, 7, 8, 11-15, 17 and 20 have been rejected under 35 U.S.C. § 102 as being anticipated by the Kindler '594 patent. Claims 4-6 have been rejected under 35 U.S.C. § 103 as being unpatentable over the Kindler '594 patent. Claim 9 has been rejected under 35 U.S.C. § 103 as being unpatentable over the combined teachings of the Kindler '594 patent and the Singh '993 patent. Claim 16 has been rejected under 35 U.S.C. § 103 as being unpatentable over the combined teachings of the Kindler '594 patent and the Pun '382 patent. The rejections under 35 U.S.C. §§ 102 and 103 are respectfully traversed. Reconsideration thereof is respectfully requested.

B. Discussion Concerning Claims 1-3 and 7

Independent claim 1 calls for a combination of elements comprising “a fuel cell stack including a **plurality of anodes**” and “a **single fuel supply apparatus** that supplies a plurality of fuel droplets to each of the anodes.” Claims 2, 3 and 7 depend from independent claim 1 and include, *inter alia*, the combination of elements defined by claim 1. The Kindler '594 patent fails to teach or suggest such combinations.

For example, as discussed in the amendment filed June 23, 2004, the Kindler '594 patent describes a number of instances where only one fuel cell (and one anode) is present. More specifically, the Kindler '594 patent indicates that aerosol may be “formed in an aerosol generator situated within the anode chamber of the fuel cell,”

“formed in an aerosol generator external to the anode chamber of the fuel cell and fed to the anode chamber via a duct,” or “formed externally to the anode chamber of the fuel cell, fed to a particle size conditioner situated between the aerosol generator and the anode chamber, and subsequently fed to the anode chamber via a duct.” [Column 2, lines 10-42.] Additionally, in the one instance where a stack of a plurality of fuel cells (and a corresponding plurality of anodes) is discussed, each anode includes *its own* aerosol generator(s). [Figure 6 and column 15, lines 57 to column 16, line 14.] The Kindler ‘594 patent does not, however, teach or even remotely suggest “a **single fuel supply apparatus** that supplies a plurality of fuel droplets to each of [a plurality of] anodes.”

In response to the arguments above, the Examiner has apparently taken the position that, because the Kindler ‘594 patent uses the phrase “aerosol generator comprising a plurality of individual in situ atomizers,” the Kindler ‘594 patent discloses a single fuel supply apparatus that supplies fuel droplets to a plurality of anodes. [Office Action at page 8, and Kindler ‘594 patent at column 15, lines 66 and 67.] Applicant respectfully submits that this interpretation of the Kindler ‘594 patent is entirely incorrect. Most notably, **the Examiner ignored the sentence immediately preceding the sentence that was paraphrased in the Office Action.** Here, the Kindler ‘594 patent clearly states that “[e]ach anode biplate 602 **has** an internal surface comprising a flowfield element 610 and **an aerosol generator.**” [Column 15, lines 63-65, emphasis added.] The Kindler ‘594 patent also states that each anode biplate 602 is placed against the anode side of a membrane electrode assembly. [Column 14, lines 52-65 and column 16, lines 15-17.] Thus, the Kindler ‘594 patent specifically indicates that each anode biplate 602 has its own built-in apparatus for supplying fuel droplets to the associated anode and, to the extent that there is a plurality of anodes in the stack, that there is a corresponding plurality of aerosol generators (i.e. one for each anode). There simply is no single aerosol generator that supplies fuel to all of the anodes.

As the Kindler ‘594 patent fails to teach or suggest each and every element of the combination recited in independent claim 1, applicant respectfully submits that claims 1-3 and 7 are patentable thereover and that the rejection thereof under 35 U.S.C. § 102 should be withdrawn.

Additionally, applicant hereby requests that the Examiner specifically address the arguments above concerning column 15, lines 63-65 of the Kindler '594 patent in order to clarify the issues on appeal.

C. Discussion Concerning Claims 4-6

Independent claims 4, 5 and 6 call for respective combination of elements including a “fuel cell” and a device that supplies fuel droplets. Claim 4 specifies that the device is a “thermal drop ejector,” claim 5 specifies that the device is a “piezoelectric drop ejector” and claim 6 specifies that the device is a “flextensional drop ejector.” The Kindler '594 patent fails to teach or suggest such combinations.

As noted on page 5 of the Office Action, the Kindler '594 patent does not disclose the use of “thermal,” “piezoelectric” and “flextensional” drop ejectors. Nevertheless, the Office Action states that it would have been obvious to substitute any one of the “thermal,” “piezoelectric” and “flextensional” drop ejectors for the ultrasonic atomizer disclosed in the Kindler '594 patent. [Office Action at page 5.] The Office Action does not, however, include any evidence whatsoever (e.g. a prior art reference) which indicates that, in the context of supplying fuel to a fuel cell, “thermal,” “piezoelectric” and “flextensional” drop ejectors are “functionally equivalent” to an ultrasonic atomizer. Note, for example, that the flextensional drop ejector illustrated in Figures 16-18 of the present application may be used to fire drops in two directions. [Page 9, line 29 to page 10, line 11.] Nor has the Office Action provided any evidence which indicates that it would have been obvious to replace an ultrasonic atomizer that is supplying fuel to a fuel cell anode with a “thermal,” “piezoelectric” or “flextensional” drop ejector.

Instead, the Office Action improperly relies on ***applicant's disclosure*** to support the rejection. [Office Action at page 5.] The Office Action appears to opine that because applicant's specification indicates that “thermal,” “piezoelectric” and “flextensional” drop ejectors may be used in some embodiments, while an “ultrasonic atomizer” is used in others, applicant has “admitted” that they are the “functional equivalent” of an “ultrasonic atomizer” and, therefore, that it would have been obvious to substitute “thermal,” “piezoelectric” and “flextensional” drop ejectors for

the for the ultrasonic atomizer disclosed in the Kindler '594 patent. This aspect of the Office Action is incorrect both factually and as a matter of law.

With respect to the facts, nowhere in applicant's specification is it "admitted" that "thermal," "piezoelectric" and "flextensional" drop ejectors are the functional equivalent of an "ultrasonic atomizer." Merely indicating that "the exemplary ultrasonic atomizer illustrated in Figures 21 and 22 and the exemplary flextensional drop ejectors illustrated in Figures 23a-26i, also have applications outside the fuel cell arena" is not an admission of functional equivalency. [Page 4, lines 15-17.] It is a simple statement which means that the ultrasonic atomizer illustrated in Figures 21 and 22 and the flextensional drop ejectors illustrated in Figures 23a-26i can be used in devices other than fuel cell related devices. No more, no less. Similarly, indicating that "ultrasonic atomizers may be used in place of thermal drop ejector in the embodiment illustrated in Figure 7" and that the "ultrasonic atomizer illustrated in Figures 20 and 21 may be used in place of thermal drop ejector(s) in any of the embodiments illustrated in Figures 4-8" is not an admission of functional equivalency. [Page 10, line 25 to page 11, line 9.] To the contrary, it merely indicates that inventors believe that, in some embodiments of their inventions, certain types of drop ejectors may be used in place of others. It is not a statement concerning what was recognized in the art prior to their inventions.

Turning to the law, the Office Action's reliance on applicant's disclosure to prove equivalence is completely improper. In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and **cannot be based on applicant's disclosure**. *In re Ruff*, 118 USPQ 340 (CCPA 1958), emphasis added, and MPEP § 2144.06.

Accordingly, applicant respectfully submits that the Office Action has again failed to make a *prima facie* case of obviousness with respect to claims 4-6 and that the rejection thereof under 35 U.S.C. § 103 is improper and should be withdrawn.

Finally, applicant notes that the arguments above were presented in the previous amendment and that the Examiner failed to address the arguments in the outstanding Office Action despite the requirements set forth in MPEP 707.07(f). **Accordingly, applicant hereby requests that the Examiner specifically address**

the arguments above (especially those concerning the improper use of applicant's disclosure) in order to clarify the issues on appeal.

D. Discussion Concerning Claims 8, 9, 11-15 and 17

Independent claim 8 calls for a combination of elements comprising “a fuel cell stack including at least one anode pair arranged such that ***the anodes within the anode pair face one another and define a fuel passage therebetween that extends from one anode in the pair to the other anode in the pair***” and “fuel supply means for supplying a plurality of droplets to the fuel passage between the at least one anode pair.” Claim 9 depends from independent claim 8 and includes, *inter alia*, the combination of elements defined by claim 8.

Similarly, independent claim 11 calls for a combination of elements comprising “a plurality of anodes pairs arranged such that the anodes within each anode pair face one another and define a fuel passage therebetween that extends from one anode in the pair to the other anode in the pair” and “a fuel supply apparatus that draws fuel from the fuel reservoir and supplies a plurality of fuel droplets to the fuel passages.” Claims 12 and 13 depend from independent claim 11 and include, *inter alia*, the combination of elements defined by claim 11.

Independent claim 14 is directed to a “method of operating a fuel cell stack.” The method includes, *inter alia*, the step of “directing a spray of fuel droplets into a fuel passage that extends from a first anode in an anode pair to a second anode in the anode pair such that at least some of the droplets come to rest on the first anode and at least some of the droplets come to rest on the second anode.” Claims 15 and 17 depend from independent claim 14 and include, *inter alia*, the combination of elements defined by claim 14.

The Kindler '594 patent fails to teach or suggest the respective combinations defined by independent claims 8, 11 and 14. For example, with respect to Figure 6, the Kindler '594 patent teaches the stacking of a plurality of MEAs to form a fuel cell. There is no indication that the MEAs are stacked such that the anodes that face one another with a fuel passage therebetween that extends from anode to the other. Nor does the Kindler '594 patent teach or suggest apparatus for, or the steps of, supplying

fuel droplets to a fuel passage that extends from one anode in an anode pair to the other anode in the pair. Moreover, given the fact that each Kindler anode includes its own aerosol generator, there is no simply reason for the Kindler fuel cell to employ the claimed anode arrangement and method.

As the Kindler '594 patent fails to teach or suggest each and every element or step in the respective combinations defined by independent claims 8, 11 and 14, applicant respectfully submits that claims 8, 11-15 and 17 are patentable thereover and that the rejection thereof under 35 U.S.C. § 102 should be withdrawn.

Turning to the rejection of claim 9 under 35 U.S.C. § 103, applicant respectfully submits that the Singh '993 patent fails to remedy the above-identified deficiencies in the Kindler '594 patent. Accordingly, claim 9 is patentable for at least the same reasons as independent claim 8 and the rejection of claim 9 under 35 U.S.C. § 103 should also be withdrawn.

E. Discussion Concerning Claim 16

Independent claim 16 calls for a combination of method steps including, *inter alia*, the step of "directing a spray of fuel droplets onto the anode by generating a spray of fuel droplets and blowing the droplets towards the anode **with a fan**." The Kindler '594 patent fails to teach or suggest such a combination. For example, the Kindler '594 patent does not teach or suggest blowing fuel droplets with a fan. The only time a fan disclosed in the Kindler '594 patent is used to supply air to a cathode. [Column 5, lines 51-54.] The Office Action has taken the position that, in view of the teachings of the Pun '382 patent, it would have been obvious to add a fan to one of the fuel cell devices disclosed in the Kindler '594 patent.

The Pun '382 patent is directed to "a spray apparatus that produces uniform sized atomized droplets controllable **from fog size to larger** for spraying fungicides, bactericides, pesticides, insecticides, plant nutrients and other materials applied to crop, ground, and foliage for agricultural and horticultural benefaction." [Abstract.] Figure 14 is also noteworthy. Nothing in the Pun '382 patent even remotely suggests its teaching are applicable to fuel droplets generally, and fuel cells in particular. In fact, the Pun '382 patent does not include the word "fuel" or the word "cell."

As the Federal Circuit reiterated once again in *In re Lee*, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002), “a showing of a suggestion, teaching, or motivation to combine the prior art references is an ‘essential component of an obviousness holding.’” [Citations omitted.] The burden of showing obviousness may be satisfied “only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references.” [Id. at 1434, citations omitted.] Here, there is absolutely no reason, other than a hindsight attempt to replicate the claimed combinations, to combine the cited references in the manner proposed in the Office Action.

Accordingly, applicant respectfully submits that the Office Action has failed to make a *prima facie* case of obviousness with respect to claim 16 and that the rejection thereof under 35 U.S.C. § 103 is improper and should be withdrawn.

Finally, applicant notes that the arguments above were presented in the previous amendment and that the Examiner failed to address the arguments in the outstanding Office Action despite the requirements set forth in MPEP 707.07(f). ***Applicant hereby requests that the Examiner specifically address the arguments above in order to clarify the issues on appeal.***

F. Discussion Concerning Claim 20

Independent claim 20 calls for a combination of elements including, *inter alia*, “a controller adapted to monitor a rate of fuel consumption at the anode and to control the fuel supply means to supply droplets at a rate that results in a ***fuel layer being maintained*** on the anode.” Although the Kindler ‘594 patent does discuss varying the amount of fuel supplied to the anode (column 7, line 31-46), it does not appear to teach or suggest maintaining a layer of fuel on the anode. The Kindler ‘594 patent actually appears to teach away from the formation of a fuel layer. [Column 8, lines 18-29.] Nevertheless, in view of the drop discussion in column 8, lines 30-48, the Examiner has concluded that fuel layer “can be formed on the anode after the fuel droplets collide and coalesce.” [April 7, 2004 Office Action at page 8.]

Applicant respectfully submits that there are a variety of errors associated with this conclusion. Most notably, it is not supported by the Kindler '594 patent.² The Office Action also conveniently ignores the fact the Kindler '594 patent spends approximately the next full column of text after the passage cited in the Office Action (i.e. from column 8, line 49 to column 9, line 50), explaining how to avoid saturation of the porous anode and, accordingly, the formation of a fuel layer on the anode. The rejection of claim 20 under 35 U.S.C. § 102 is, therefore, improper and should be withdrawn.

Finally, applicant notes that the arguments above were presented in the previous amendment and that the Examiner failed to address the arguments in the outstanding Office Action despite the requirements set forth in MPEP 707.07(f). ***Applicant hereby requests that the Examiner specifically address the arguments above in order to clarify the issues on appeal.***

IV. CLOSING REMARKS

In view of the foregoing, it is respectfully submitted that the claims in the application are in condition for allowance. Reexamination and reconsideration of the application, as amended, are respectfully requested. Allowance of the claims at an early date is courteously solicited.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is respectfully requested to call applicant's undersigned representative at (310) 563-1458 to discuss the steps necessary for placing the application in condition for allowance.

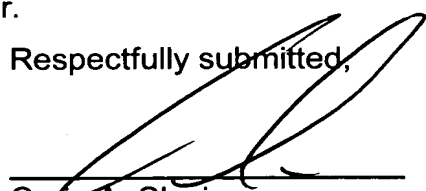
The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-2025. Should

² To the extent that the Examiner has taken "official notice" with respect to knowledge generally available in the art, applicant hereby traverses and requests that the Examiner provide an affidavit in accordance with MPEP § 2144.03 and 37 C.F.R. § 1.104(d)(2) to that effect.

such fees be associated with an extension of time, applicant respectfully requests that this paper be considered a petition therefor.

Date 1/3/05

Respectfully submitted,



Craig A. Slavin
Reg. No. 35,362
Attorney for Applicant

Henricks, Slavin & Holmes LLP
840 Apollo Street, Suite 200
El Segundo, CA 90245
(310) 563-1458
(310) 563-1460 (Facsimile)